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An Annotated Checklist of Freshwater Fishes of Armenia

B.K. Gabrielyan

Abstract

A list of freshwater fishes inhabiting lakes, reservoirs and rivers of Armenia is presented which include 39 species and subspecies belonging to 5 orders, 9 families and 29 genera. A brief description of the ecology, distribution and present status (introductions, threats, commercial value) of these fishes is given.

Introduction

Armenia (Fig. 1) is one of the countries of the Transcaucasus Region with extremely limited water resources. Although there are over 100 small lakes and reservoirs in Armenia, with total areas ranging from a few square meters to tens of hectares, these are generally shallow with an average depth of less than or equal to10 m. Table 1 lists the main water bodies of Armenia and summarizes selected characteristics (i.e. location, altitude, depth, area, length) and notes on their fauna. The territory of Armenia slowly sank below sea level before the Pliocene Period when the river systems were formed. Fossils of *Rutilus rutilus* and *Alburnus alburnus* described by Bogachev (1927), as well as trout described by Vladimirov (1944) discovered in the upper layers (early Pliocene) of Ararat Valley were dated to the Tertiary Period. Major changes in the ichthyofauna of Armenian reservoirs occurred during the last glacial period, when

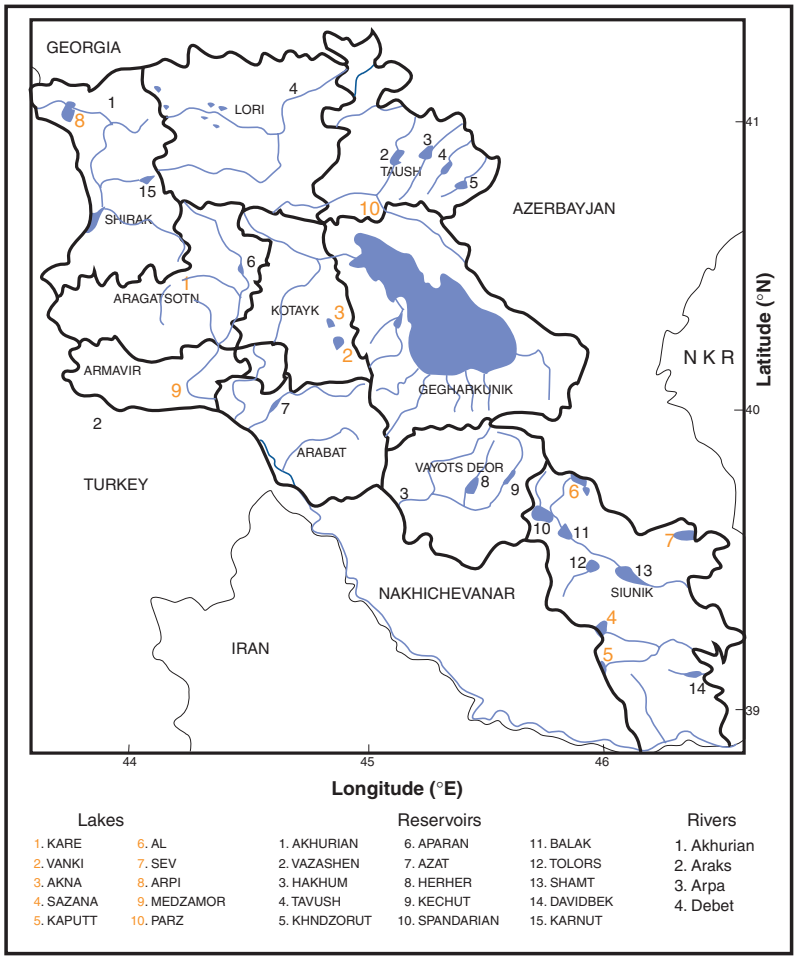

Fig. 1. Key water bodies and rivers in Armenia.

Table 1. The main water bodies of Armenia.

Water body	Location	Altitude (m above sea level)	Maximum depth (m)	Area (ha)	Length (km)	Remarks
Lakes						
Akna	Top of Gegam range	3030	14	50.	-	Used to grow Sevan's trout, *Salmo ischcan*.
Kari	Mountain Aragats	3185	8	12.5	-	Used as a reservoir to grow Sevan's trout since the 1960's.
Sev	Southeast of Armenia	2660	8.5	192	-	Sevan's trout was introduced in the 1960's-70's.
Sevan	*Northwest of Armenia*	*1916*	*78*	*1250*	-	*One of the biggest Alpine reservoirs of the world.*
				km^2 (Change to ha,)		*Inhabited by mainly endemics to the lake including Sevan's trout, some salmonids, cyprinids and coregonids.*
Reservoirs						
Akhurian	Northwest of Armenia	2000	55	4180	-	Inhabited by cyprinids.
Aparani	Northwest of Armenia	1812	40	750	-	Inhabited by cyprinids.
Arpi Lich	*Southeast of Armenia*	*2025*	*2.5*	-	-	*Second to Lake Sevan in fish productivity,* Cyprinus carpio carpio *is the main catch reaching 1 ton per year. Other cyprinids and salmonids also inhabit the reservoir.*
Spandariani	Southeast of Armenia	2344	76	1425	-	Inhabited by cyprinids and salmonids.
Rivers						
Akhurian		-	-	-	*205*	*Inhabited mainly by cyprinids.*
Araks	Connected to Caspian sea	-	-	-	158	Inhabited by most fishes listed except for salmonids. Most rivers of Armenia are tributaries of this river (Akhurian, Arpa, Debet, Hrazda, Marmarik, Vorotan, etc.).
Arpa		-	-	-	200	Inhabited mainly by *Salmo trutta fario* upstream and cyprinids downstream (Simonian et al. 1990, Gabrielyan 1999).
Debet		-	-	-	300	Inhabited by *Salmo trutta trutta*.

almost all warm-loving fishes became extinct in mountainous lakes and rivers at higher elevation. At the end of the glacial period, fishes again began to inhabit the Araks and Kura rivers .

The first scientific report of fishes and fisheries in Armenia was made in the 4th century by V. Kesariyski (Muradian 1976). However, systematic ichthyological investigations of Lake Sevan and other reservoirs and rivers of Armenia only began in 1923 when the Sevan Lake Station (now called the Institute of Hydroecology and Ichthyology, National Academy of Sciences of the Armenia) was established. The ichthyofauna of commercially significant reservoirs and rivers of the country has been investigated and their ecology and morphology studied. Recommendations on the acclimatization of new fish species from other countries and the restocking of disappearing endemics in various reservoirs of Armenia and other countries were developed. The latest and most comprehensive work entitled "Fish of Armenia" by M.G. Dadikian was published in 1986. Separate works on newly introduced fish species in Armenia were also published.

This paper presents a list of freshwater fishes of Armenia with current data on ecology and distribution.

Check list of freshwater fishes

ORDER I. SALMONIFORMES
Family 1. SALMONIDAE

1. *Salmo trutta fario* (Linnaeus 1758)

Found in almost all rivers of Armenia and the Akhurian and Arpi Lich reservoirs. At present, this fish species has almost disappeared from some rivers due to poaching and water pollution. It can live up to 12 years and its maximum body length can reach 25 cm. Males mature when body length reaches 12.5 cm (1st to 3rd year); females at 14.7 cm (3rd to

4th year). Habitat significantly affects female fertility. Fish size and habitat affect diet composition which include insects and their larvae, fish, worms and eggs of other fish (Berg 1949, Dadikian 1986, Vladimirov 1948).

2. *Salmo trutta trutta* (Linnaeus 1758)

Recorded from Kura River and swims upstream to Dzoraget and Pambak rivers and their tributaries and to Araks river and its tributaries – Arpa, Azat, Debet, Hrazdan, Kasakh and Vedi - to spawn. At present, hydropower stations on the Dzoraget and Kura rivers as well as dams on Debet river prevent the fishes from reaching their spawning sites. The Araks river however enables a small proportion of the fish population to reach Arpa river and several rivers of Ararat Valley. Body length reaches 31 cm (Derjavin1926, Berg 1949, Dadikian1986).

3. *Salmo ischchan* (Kessler 1877)

Recorded from Akna, Kari, Sev, and Sevan rivers and the Aparani and Mantash reservoirs. Body length reaches 50 cm (Barach 1949, Dadikian 1986, Vladimirov 1944, Frank 1984, Smoley 1976, The Red Book of Armenia (Animals) 1987, Savvaitova et al. 1989).

This species is endemic to Lake Sevan and can be divided into 4 races:

a) *Salmo ischchan gegarkuni* (Kessler 1877)

Normally spawns in rivers. However, because of dams with traps close to mouths of rivers, this has become almost impossible. Some females reach maturity during the 3rd year, most between the 5th to 6th year while males mature during the 2nd year. Diet consists mainly of *Gammarus* sp., fish and amphibia, insect larvae and Daphnia. The population of this fish species is currently being sustained using artificial reproduction.

b) *Salmo ischchan aestivalis* (Fortunatov 1927)

This species spawns in rivers. Spawning occurs at slow drifts of a river, as well as in Lake Sevan (in river mouths or near them in the lake). In contrast to other subspecies, it spawns in the warm season. Although its embryonic period is shorter under warm conditions, egg survival during this period is lower. Larvae may appear in 45-55 days. Spawning has ceased due to the decrease in water level of Lake Sevan. River spawning did not occur for reasons similar to *Salmo ischchan gegarkuni*. Age at first maturity varies from 2 - 7 years. Diet consists of *Gammarus* sp., insect larvae, as well as flying insects and early zooplankton (July-October). As with *Salmo ischchan gegarkuni* the population of this fish species is currently being sustained using artificial reproduction. However, the race is endangered due to its small numbers.

c) *Salmo ischchan ischchan* (Kessler 1877)

Before the decrease of Lake Sevan's water level, spawning sites in the littoral zone were available and the fish population was adequate (30% of the trout population). Today, it is considered endangered together with the three other subspecies, although some individuals have been observed on spawning sites. Their diet consists of benthos, preferably *Gammarus* sp. (90-95% of all nourishment by weight), as well as Hirudinea, shellfish and insect larvae. Adults feed on fish and amphibia. This species has not been recorded in Armenia in the last decade. It is possible that this race may be extinct.

d) *Salmo ischchan danilewskii* (Yakowlew 1888)

Within Lake Sevan, the species reproduces from mid-October till the end of November. The most favorable temperature for egg laying is 10°C at a depth of 0.2-15 m. This species grows very slowly and exhibits strict requirements in terms of diet. Related to this, the fish is not of great commercial value and is not bred at fish farms. Currently, it has completely disappeared. Diet consists of *Gammarus* sp., Hirudinea, insect larvae and zooplankton. This species has not been recorded in Armenia in the last decade. It is possible that this race may be extinct.

4. *Oncorhynchus mykiss* (Walbaum 1792)

This species is bred in fish farms throughout Armenia. Commercial production reaches 500 t/yr. Maximum body length is 50 cm.

Family 2. COREGONIDAE

5. *Coregonus lavaretus* (Linnaeus 1758)

This fish species is a hybrid of *Coregonus lavaretus ludoga* [referred to as *C.L.lavaretus* by the new taxonomic system (Reshetnikov et al. 1997)] and *Coregonus lavaretus marineoidis* introduced into Lake Sevan in the 1920s. It inhabits Lake Sevan and the Kechut reservoir. Its body length can reach 35 cm. Catches can reach 12 000-13 000t/yr. Natural spawning in the lake has been observed since

1927. Decrease in water level of the lake resulted in an increase in fish population due to favorable conditions for reproduction, increasing the annual catch by 29-40% in 1965.They spawn at the littoral zone (1-15 m) and reproduce during November-January. They feed on zooplankton (*Cyclops* sp., *Daphnia* sp. and *Diaptomus* sp.,), benthos (in Spring) and shellfish (Pizidiums) (in Autumn). The fish competes with trout in feeding on *Gammarus* sp. (Smoley 1976, Snetkov, et al. 1983, Yujakova et al. 1987, Barach 1949).

ORDER II. CYPRINIFORMES

Under this order three fish families are present in Armenia: Cyprinidae (20 genera), Cobitidae (1 genus) and Balitoridae (1 genus).

Family 3. CYPRINIDAE

6. *Acanthalburnus microlepis* (De Fillipi 1863)

Found in the Arpa and Vorotan rivers and the Kechut reservoir. Body length reaches 25 cm (Berg 1949).

7. *Alburnus filippi* (Kessler 1877)

Recorded from all rivers of Armenia and the Arpi Lich reservoir. Maximum body length is 12 cm (Berg1949).

8. *Alburnus alburnus hohenackeri* (Kessler 1877)

Body length reaches 10 cm (Berg 1949).

9. *Alburnoides bipunctatus* (Bloch 1782)

This fish species is endemic to Armenia and found in almost all rivers and reservoirs (except the Lake Sevan basin). It matures between 2-3 years. Spawning period is from end of April to August, depending on the altitude and water temperature. Body length reaches 10 cm (Dadikian 1986).

10. *Aristichthys nobilis* (Richardson 1945)

Introduced into Armenia for aquaculture from Russia, Moldova, and Uzbekistan. At present, some individuals have been observed in the Akhurian and Araks rivers.

11. *Aspius aspius* (Linnaeus 1758)

Recorded from the Akhurian, Arpa, Metsamor and Vorotan rivers and the Akhurian and Arpi Lich reservoirs (Barach 1949, Berg 1949).

12. *Barbus lacerta cyri* (De Filippi 1865)

This species is widely distributed, inhabiting Lake Akna, almost all reservoirs of Armenia and the Akhurian, Debet and Metsamor rivers. Spawning is from June to August. Eggs develop at a wide temperature range, which explains its wide distribution. It feeds on various invertebrates. Body length reaches 18 cm (Berg 1949, Dadikian 1986).

13. *Barbus goktschaicus* (Kessler 1877)

An endangered species endemic to Lake Sevan and its tributaries. Consists of three biotypes: lake, lake - river, and river. The river type is the smallest and inhabits only lake tributaries. Body length reaches 30 cm. Spawning period is from the first half of June till the first half of August. Males mature between 3-4 years while females mature between 5-6 years. Feeds on *Gammarus* sp., insect larvae and eggs of other fish (including trout). The river type species feeds mainly on flying insects (Chikova 1955, The Red Book of Armenia (Animals) 1987).

14. *Barbus capito* (Güldenstädt 1772)

Found in the Akhurian and Metsamor rivers and some reservoirs of Armenia (Akhurian, Arpi Lich and Hrazdan). Body length reaches 40 cm (Derjavin 1926, Berg 1949, Dadikian1986).

15. *Barbus mursa* (Güldenstädt 1772)

Recorded from the Akhurian, Arpa, Metsamor and Vorotan rivers and the Arpi Lich reservoir. Body length reaches 22 cm (Barach 1949, Berg1949).

16. *Blicca bjoerkna* (Linnaeus 1758)

Inhabits River Metsamor. Body length reaches 12 cm (Derjavin 1926,Barach 1949, Dadikian 1986).

17. *Carassius gibelio* (Bloch 1782)

Found in almost all ponds, lakes and rivers of the Ararat Valley, as well as in reservoirs in most regions of Armenia. It was introduced into Lake Sevan in the early 1980s and is presently second in importance to white fish. Body length can reach 30 cm; it can reach an age of 8 years and weigh up to 1 kg. Mature fish feed on detritus and some Hironomid larvae and mollusks. In the Ararat Valley, it matures at 1 year, 7.7 cm and 16.3 g. In the lake, it matures by the third year, at 14.5 cm and 87.2 g. It spawns 3-5 times per year in the reservoirs of the Ararat Valley and 2-3 times in Lake

Sevan. Catch reaches 3 000-4 000 t/yr (Smoley et al. 1987, Pipoyan 1993).

18. *Chondrostoma cyri* (Kessler 1877)

Recorded from the Akhurian, Debet, Marmarik and Metsamor rivers, related lakes and the Arpi Lich reservoir, except for the Lake Sevan basin. Spawning period is prolonged at high altitudes. In the reservoirs of Ararat Valley, however, spawning lasts from late March to early April. It feeds on plants, as well as flying insects and larvae of aquatic insects. Body length reaches 20 cm (Berg 1949, Barach 1949, Dadikian 1986).

19. *Ctenopharyngodon idellus* (Valenciennes 1844)

Introduced into Armenia from the Far East for weed control in reservoirs and irrigation systems, it has now become more important in aquaculture. This species suppresses plant overgrowth in the natural and artificial ponds of Ararat Valley thereby raising fish productivity. Maximum body length is 40 cm. Aquaculture production reaches 1-2 t/yr (Berg 1949, Dadikian 1986).

20. *Cyprinus carpio carpio* (Linnaeus 1758)

Inhabits Lake Sevan, Akhurian and Metsamor rivers and some reservoirs of Armenia (Akhurian, Arpi Lich, Gokhas and Spandariani). It is used in aquaculture. Feeds on animals (benthos, zooplankton) as well as aquatic plants. Maximum body length is 50 cm (Derjavin 1926, Berg 1949, Dadikian 1986). Aquaculture production reached 1 000-1 500 t/yr in the 1980s. However at present it only reaches 30-50 t/yr.

21. *Gobio persus* (Günther 1899)

Recorded from the Akhurian and Metsamor rivers and the Arpi Lich reservoir (Barach 1949, Berg 1949).

22. *Hypophthalmichthys molitrix* (Valenciennes 1844)

This species was introduced from the Far East and is important in aquaculture. Feeds on zooplankton. Body length reaches 45 cm (Berg1949, Dadikian1986). At present, aquaculture production amounts to 200-300 t/yr, although 3 000 – 4 000 t/yr was recorded in the early 1980s.

23. *Leucaspius delineatus* (Heckel 1843)

This species is widespread in the lower portion of the Hrazdan River and the reservoirs of Armavir region. It is a new addition to the ichthyofauna of Armenia (Pipoyan 1996a).

24. *Leuciscus cephalus* (Nordmann 1840)

Recorded from almost all reservoirs of Armenia (Aparani, Arpi Lich, Gokhas, Spandariani, etc.), except from the Lake Sevan basin and several small mountain lakes. Body length reaches 18 cm (Berg 1949, Dadikian 1986).

25. *Mylopharyngodon piceus* (Richardson 1846)

Introduced from Russia, Moldova, and Uzbekistan for aquaculture. Some individuals have been recorded from the Akhurian and Araks rivers.

26. *Pseudorasbora parva* (Temminck and Schlegel 1846).

Introduced and now inhabits all reservoirs of Ararat Valley and neighboring territories (Pipoyan 1996b).

27. *Rhodeus amarus* (Bloch 1782)

Widespread in all reservoirs of Ararat Valley. Recently recorded in Armenia (Pipoyan 1996c).

28. *Rutilus rutilus* (Linnaeus 1758)

Found in the Sevdgur river basin, a small tributary of Araks River and Lake Aygerlich. Year-round temperature range is 10-16°C. Has the highest fat content among fishes of Armenia's reservoirs. Body length reaches 15 cm (Derjavin 1926, Dadikian 1986, Barch 1949).

29. *Varicorhinus capoeta sevangi* (De Filippi 1865)

This species is endemic to Lake Sevan and spawns from the second half of May to August. The decrease in the lake's water level has impacted on spawning sites resulting in decrease in populations. Females mature at 6 years, males at 2-3 years. This fish prefers to feed on detritus. Juveniles (3 years and below) feed on zooplankton and zoobenthos. Body length reaches 35 cm. Catches reach 800 t/yr (Malkin 1967, Gabrielyan 1988).

30. *Capoeta capoeta* (Güldenstädt 1772)

Found in almost all reservoirs of Armenia and the Arpa, Debet and Vorotan rivers. Body length reaches 30 cm (Berg 1949, Dadikian 1986).

Family 4. COBITIDAE

Only one species is present in Armenia, and is unimportant for both commercial and recreational fishing.

31. *Sabanejewia aurata* (De Filippi 1863).

Recorded from all rivers of Armenia. Body length reaches 10 cm (Berg 1949, Nalbant 1963, Reshetnikov et al. 1997).

Family 5. BALITORIDAE

32. *Nemacheilus angorae* (Steindachner 1897)

Recorded from all rivers. Body length reaches 8 cm. It is considered dangerous as in some cases it competes for food with valuable fish species, destroys their eggs and feeds on their young (Berg1949, Derjavin1986, Kottelat 1997, Reshetnikov et al. 1997).

33. *Barbatula barbatula caucasica* (Berg 1898)

Recorded from all rivers. Body length reaches 9 cm (Berg 1949, Kottelat 1997, Reshetnikov et al. 1997).

ORDER III. CYPRINODONTIFORMES

Family 6. POECILIIDAE

34. *Gambusia affinis* (Baird and Girard 1853)

Body length reaches 6 cm (Berg 1949, Dadikian 1986).

35. *Gambusia holbrooki* (Girard 1859)

Introduced into Armenia from the southern and eastern states of USA, Mexico and Cuba for mosquito control. It feeds on mosquito larvae. Body length reaches 6 cm (Berg 1949, Dadikian 1986).

ORDER IV. SILURIFORMES

Family 7. SILURIDAE

36. *Silurus glanis* (Linnaeus 1758)

Recorded from Akhurian, Arpa, Metsamor and Vorotan rivers and the Akhurian reservoir. Swims upstream up to 1 000 m above sea level. Body length reaches 100 cm (Berg 1949, Dadikian 1986).

Family 8. ICTALURIDAE

37. *Ictalurus punctatus* (Rafinesque 1818)

Introduced into Armenia from Russia for aquaculture. Currently, some individuals have been observed in Araks River and within the Ararat Valley.

ORDER V. PERCIFORMES

Family 9. GOBIIDAE

38. *Knipowitschia caucasica* (Berg 1916).

Widespread in Metsamor River and the Ararat Valley reservoirs. Has also been introduced into other reservoirs of Armenia (Pipoyan and Tigranyan 1998).

39. *Neogobius fluviatilis* (Pallas 1814)

Widespread in almost all reservoirs and fish ponds of Ararat Valley. It has also been introduced into other reservoirs of Armenia (Pipoyan and Tigranyan 1998).

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B.K. Gabrielyan *is from the Institute of Hydroecology and Ichthyology, National Academy of Sciences of Armenia.*